



Air Force Research Laboratory | AFRL

Science and Technology for Tomorrow's Aerospace Forces

Success Story

COMBINED ENVIRONMENT TESTING SOFTWARE CRADA SIGNED

Air Force Research Laboratory Material Characterization Software: Stress Control Testing

REQUESTED TEST PARAMETERS

Thermocouple	Strain card (mm)	R-value	Area of specimen (m ²)
2.0.000000	2.0.000000	2.0.10	2.0.14000000
Gage Length (mm)	Load card (N)	Frequency (Hz)	Requested Max stress
2.0.40	2.000000	2.10.00	2.0.00
Max cycle count	Starting cycle	Directory to save data	Disc Interval
2.3000	2.1.00	2.1.00	2.1.00.00

ACTIVE PARAMETER VALUES

Current cycle count	Max EP Voltage	Max Stress (MPa)	Max Temp. 1 (C)
1	0.000000	0.002500	186.3
Modulus (GPa)	Min EP Voltage	Min Stress (MPa)	Min Temp. 1 (C)
0.000000	0.000000	0.002500	51.3
Min EP Voltage	Max Strain (mm/mm)	Max Temp. 2 (C)	Cycle Count Limit
0.000000	0.000000	186.3	35.9
Crack Size	Min Strain (mm/mm)	Min Temp. 2 (C)	
0.0000	0.0000	35.9	

**Simulated Loads
Low Pressure
Inert Atmospheres
Elevated/Cryo-Temperatures**

STOP

Hydraulics Interlock
Stop Button Activated
Cycle Count Limit

The Air Vehicles Directorate Structures Division and MTS Systems Corporation signed a Cooperative Research and Development Agreement (CRADA) to commercialize the Air Force Combined Environment Testing Software (CETS). Each sale produces a net profit to the Air Force of \$150 per commercial sale of CETS. Engineers use CETS to perform mechanical testing on materials/structures in extreme environments. The directorate and MTS share an interest in developing software that will allow simulation of Space Operation Vehicle (SOV) mission profiles.



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Accomplishment

The directorate's Structures Division plans to invest one third of its research budget over the next seven years in the development and demonstration of space technologies for the SOV. The Structures Division possesses unique facilities and equipment for supporting mission requirements in research and development of structural components. For example, the fatigue and fracture test facility contains mechanical and hydraulic test machines capable of supporting component testing of forces up to 500,000 lbs and an MTS environmental chamber system that simulates the atmosphere of space.

The Air Force will obtain a new MTS TestStar II system, as well as repair two existing MTS TestStar II systems. The TestStar II control system is an automated digital system used to control single station, single channel closed loop dynamic testing systems. TestStar II uses graphical, mouse-driven system software to set up and manage tests and to collect data. Time-critical processes such as closed loop control, limit detection, and data acquisition take place in the controller firmware. TestStar II can be configured on new dynamic test systems, or as an upgrade to existing MTS test systems or those from other suppliers. In addition, the Air Force will advance its testing software to evaluate next-generation air/space structures under extreme conditions.

Background

Engineers use CETS and equipment manufactured by MTS to perform mechanical testing of materials and structures in a simulated space environment. CETS evaluates sub-scale designs of components under simulated operational conditions. Some critical concerns for the SOV are the thermal protection system, fuel tanks, and integrated structures, which must be lightweight and durable in order to conform to requirements. CETS will control loads, temperature, and pressure using an MTS environmental chamber system. Through control of these parameters, CETS can simulate an entire SOV mission's flight loads and temperature profiles.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTT, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (01-VA-03)